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THE FOUR REGIONAL RESEARCH LABORATORIES

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It is a pleasure to comply with the many requests for information on some of the wartime accomplishments of the Department of Agriculture's Four Regional Research Laboratories.

These laboratories were created for a specific purpose, namely, to search primarily for industrial outlets for farm products. It was in 1938 that Congress authorized the appropriation for these laboratories and directed the Secretary of Agriculture to establish one in each of four major farm producing areas of the country.

After a careful and thorough survey of the agricultural situation and of the commodities to be studied in the four regions, Vice-President Wallace, who was then Secretary of Agriculture, announced that the laboratories would be located at Peoria, Illinois, for the North Central States; New Orleans, Louisiana, for the South; Philadelphia, Pennsylvania, for the East; and Albany, California, for the West. Plans and specifications for the building of these laboratories, which are operated by the Bureau of Agricultural and Industrial Chemistry of the Agricultural Research Administration, were pushed as fast as possible. Directors were appointed as follows: O. E. May, Northern; D. F. J. Lynch, Southern; P. A. Wells, Eastern, and T. L. Swenson, Western.

Only a few changes have occured in the administrative personnel since the Directors were appointed. Dr. Henry G. Knight, who was Chief of the Bureau when the laboratories were organized, passed away in July of 1942 and Mr. H. T. Herrick was made Director of the Northern Laboratory when Dr. O. E. May was brought to Washington as Coordinator of Chemical Research for Dr. E. C. Auchter, Research Administrator for the Department.

The cornerstones of the Northern, Eastern, and Western Laboratories were laid in October, 1939, and of the Southern Laboratory in December of the same year. Some difficulty was encountered in finding the large number of properly qualified scientists needed in these laboratories and in obtaining the necessary fixtures and equipment, but all laboratories were occupied and research was started in all of them by the middle of 1941.

Perhaps I should state here that these laboratories were built for peacetime research, but like many other agencies throughout the country, they are now working 100 percent on war projects. The general program remains the same but the emphasis in the work has been shifted to those phases which have specific and immediate wartime application. More than a thousand persons, over half of whom are highly trained chemists, physicists, engineers and other scientists, are now employed in these centers. Research is under way in these laboratories on close to 150 projects which are directly connected with the industrial use of agricultural products in the war effort. These include work on rubber, industrial alcohol, smokeless powder, plastics, industrial proteins, essential drying oils, synthetic fibers, rotproofing of sandbag material, rubberless cotton fire hose, preservation of vegetables by dehydration and freezing, substitutes for cork and for palm and other imported industrial oils, conservation of leather, and many other important projects . Although they have been operating a comparatively short time, each laboratory has already contributed a number of worthwhile wartime and perhaps peacetime developments. A brief discussion of one or two outstanding accomplishments from each one will illustrate how this research is utilizing agricultural commodities as replacements and substitutes for critical war materials.

The Northern Laboratory, for example, has made a rubber substitute from soybean oil. It is not a material that is alone suitable for automobile tires, but it can be and is being used for a great many purposes, such as rubber heels, tubing and gaskets, for which natural rubber was used before we entered the war. The name of this new product is "Norepol" which comes from the first two letters in NOrthern and REgional, and the first three letters in POlymerization. It was being produced commercially at the rate of about 70 tons a month around the first of the year, but the production is less than that now because more soybean oil is being diverted to food purposes. The scientists are not only continuing their research on Norepol so as to improve it, but they have learned also that it can be made from any vegetable oil that contains sufficient linoleic acid. Linseed, cottonseed, and perhaps other vegetable oils may be used in the production of Norepol, and there is a valuable byproduct of meal since only the oil is used in making the rubber substitute.

The Northern Laboratory has also developed a new type of lignin plastic which can be made from farm wastes and used as a replacement for metal for many purposes. This new thermosetting plastic, which means that it will harden under heat or pressure, can be made from corn stalks, wheat straw, flax shives, and other fibrous materials. It can be made with one-half the phenol-formaldehyde resin commonly required in the manufacture of this type of plastic thus saving an allocated material which is badly needed for molding purposes. This new plastic was tried in commercial plant operations and was found to mold satisfactorily in standard automatic molding machines. Bottle caps were molded during the test and it was found that this plastic is also satisfactory for an important military use, which for strategic reasons may not be revealed.

The Southern Laboratory at New Orleans recently announced the development of a substitute for imported palm oil used extensively in this country in the production of tin and terne plate and in the making of sheet steel by the cold reduction process. The substitute is a properly hydrogenated cottonseed oil and creates perhaps a large demand for an important agricultural raw material of the South. This discovery has given the tin and steel industries a "tailor made" substitute that is actually better in some respects than the original article which was imported from the Dutch East Indies and consequently shut off when we entered the war. Specifications for the production of this oil have been prepared and turned over to oil mills, so that we can now turn safely to the substitute even before our stocks of imported oils are exhausted if we wish to do so. Research solved the problem.

Another contribution from the Southern Laboratory is the development of a substitute for cotton linters used extensively in the manufacture of smokeless powder, which is needed for our big guns, anti-aircraft shells, army rifles, and so on. The short-fuzzy fiber or linter that is removed from the seed after the cotton is ginned is particularly adapted to nitrating, which is one of the steps in the production of smokeless powder. Under normal times we produce enough linters to meet our demands, but in a war like we are in now, we shoot up so much powder that there is danger of exhausting the supplies of some of our raw materials unless we discover substitutes. That's what was done in this case. A machine was designed that would cut ordinary lint cotton, since there is no commercial machine which will do the job. Normally lint cotton is too expensive to use in making powder. The first machine, a small one, was satisfactory. Therefore, designs for a large machine, which will cut into very short pieces similar to linters enormous quantities of cotton in a short time, were drawn up and such a machine is now under construction and will soon be available for commercial use.

Apple sirup, a development of the Eastern Laboratory, is now in large-scale commercial production. Five plants in the United States and one in Canada made a total of more than 3 million pounds of sirup from the 1942 apple crop, and the indications are that as much as 15 or 20 million pounds may be made from the '43 crop.

The tobacco industry in the curing and conditioning of certain types of tobacco, is using apple sirup as a replacement for glycerin, needed in making explosives and therefore no longer available for use in the manufacture of cigarettes and other forms of tobacco. The refined sirup is made from ordinary apple juice which can be made from any grade of "juice" apples as well as from the waste peels and cores from canning and dehydration plants. The raw material for this new product comes largely from the 25 million bushels of off-grade apples that fail to find a market each year. In finding an industrial outlet for this surplus material, the Department is not only helping the war effort by developing a replacement for a critical material, but is following the mandate of Congress which authorized these laboratories to search for new and wider industrial outlets and markets for agricultural commodities, in peacetime.

One of the Western Laboratory's contributions to the war effort is the outstanding work it has done and is still doing on the dehydration of foods, particularly vegetables. When submarine sinkings limited shipping space, the situation was met in part by turning to dehydration, which reduces both the bulk and weight of the fresh products.

This problem was tackled in a big way at the beginning. Pilot-plant or semi-commercial size machines were built and operated right in the laboratory.

Approximately one-third of the Western Laboratory's entire space was given over to dehydration work. As a result of this large-scale research, many commercial operators were supplied with urgently needed information on such things as the preparation, blanching, processing, and packaging of dehydrated vegetables. Schools were held where operators were instructed and trained in the latest methods of dehydration. It is believed that more than 500 million pounds of foods will be dehydrated this year, and much of it will be done according to the methods developed at the Western Laboratory. This laboratory's research on frozen food products, used extensively by the armed forces, has also contributed to the war effort.

There are several reasons for the accomplishments that have come from these laboratories in the comparatively short period they have been in operation. First, one-third of the space in each of the four laboratories is given over to pilot-plant studies. This enables the scientists to try their test-tube results obtained in the laboratory on a semi-commercial basis as soon as they are ready. Pilot-plant research in the agricultural field has been handicapped in the past because of the added and sometime prohibitive expense involved in carrying the investigations beyond the test-tube stage. Our great pilot-plant laboratories partly meet this need.

Another reason for the success that has come to these laboratories is the fact that they have received whole-hearted cooperation from industry and governmental institutions. Each spring, for example, the directors of the agricultural experiment stations in the different regions meet at the laboratory in their region and spend considerable time reviewing the accomplishments of the past year with Laboratory, Bureau and Research Administration officials. This annual visit keeps the experiment station people in touch with the research activities in the laboratories and enables them to make constructive suggestions on the importance of present and contemplated research.

Industry has cooperated by having representatives attend conferences announcing the discovery of pertinent facts, and many firms have allowed our men to run large-scale tests on their regular commercial machines. These commercial-size checks on our laboratory and pilot-plant findings have speeded up our work and greatly hastened its application in industry.

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